Tutorial: Novel way of training conceptual modeling skills by means of feedback-enabled simulation

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Abstract: Learning requirements analysis and validation through conceptual modeling is very hard. Experienced analysts manage to mentally picture (i.e. simulate) the future information system in their mind while analyzing and validation requirements. This skill is very hard to achieve by junior requirements engineers. Not surprisingly, computer-based simulation has been proven to be an excellent technique in assisting juniors in understanding complex systems. However, the practical use of computer-based simulation is hampered by the difficulty of swiftly generating simulations out of conceptual models and the difficulty of interpreting simulation results. This tutorial reviews the challenges in teaching conceptual modeling and model simulation, and the gains that can be obtained when using ***feedback-enabled simulation***. The tutorial is based on a novel, award winning and scientifically proven method [1-18] that boosts the learning achievements in conceptual modeling.

Novelty: Our research presents significant positive effects on learning achievements of novices for conceptual modeling when using a novel method for conceptual model simulation that is 1. adapted to limited technical expertise of novices using easy and fast ("single-click") approach 2. adapted to conceptual modeling goals in which constructs irrelevant for conceptual modeling goals are filtered away, and 3. is ***enhanced with feedback*** that links simulation results to their causes in a model design. Learning effectiveness of a method on model understanding is measured with respect to comprehension of semantic quality of a model as presented by Conceptual Modeling Quality Framework. The approach presented in the tutorial has been nominated for an educational award by KU Leuven, Belgium.

For whom it is intended: This tutorial is targeted towards a broad audience (faculty staff, professional industry educators, practitioners, researchers, students) that want to obtain/improve skills in the domain of conceptual modeling and prototyping-based testing/validation of conceptual models.

Highlights: The attendees will learn an innovative approach for learning/teaching conceptual modeling with the use of fast prototyping that serves as a conceptual model simulation instrument. As a diagramming technique we opted for a UML diagramming approach as it is the widely used standard to visually represent a system's structural and behavioral aspects both in high level conceptual modeling as well as in more detailed models for lower level program design. We first present the principles that were applied to obtain an effective simulation tool followed by the principles of setting up automated feedback making the links between a prototype and its model design will be introduced. The goal of the presented method is threefold: 1) visualizing solution-oriented requirements which enables semantic conformance checking with domain experts by serving as a ***simulation instrument*** to communicate scenarios with users in a fast and easy way 2) moving the testing of a prospective system into the requirements engineering phase using conceptual modeling 3) additionally, allowing less experienced analysts detecting own specification errors such as conflicting, wrongly captured or missing requirements, and design errors that result from misinterpreted use of modeling language constructs. Subsequently we present an overview of the learning benefits with ***feedback-enabled simulation***. Effectiveness of the method over traditional manual inspection and validation was confirmed by empirical experimental studies using an experimental sample of 185 users. The scientific results will be briefly presented.

Tutorial history: This is a new tutorial. However, it presents an extract of a 40-hours course that runs for 5 years in its actual format.

Presenters' Bios

Monique Snoeck holds a PhD in computer science from the KU Leuven. She is full professor in the Department of Decision Sciences and Information Management of the Faculty of Economics and Business of the KU Leuven and visiting professor at the University of Namur (UNamur). Her research focuses on conceptual modeling, requirements engineering, software architecture, model-driven engineering and business process management. Main guiding research themes are the quality of conceptual models, the automatic transformation of models to platform specific models or code and the integration of business process modeling & enactment with IS modeling and development. Her book titled "Enterprise Information Systems Engineering - The MERODE Approach" was published in Springer. Monique Snoeck has presented numerous industrial tutorials in the past through the Belgian organization SAI (www.sai.be) and at former editions of the TOOLS conferences and the CAiSE conference.

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Gayane Sedrakyan is a PhD researcher at KU Leuven. She got master degrees in Management Information Systems from KU Leuven, Belgium, 2012 and Computer and Information Science from American University of Armenia, 2007. She received an award in the nomination of “Best master student in Information Technologies (2007)” by the President of Armenia and Synopsys corporation. Gayane has 8 years of programming experience. Her research interests include model driven engineering, simulation of conceptual models, prototyping-based testing of requirements, process-oriented feedback and feedback automation. Based on MERODE methodology she has been developing a feedback-enabled semantic prototyper to facilitate the (learning) process of requirements analysis and modeling.

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